

What is claimed is:

1. A contact for a semiconductor device, comprising:
an intermediate conductive layer in electrical contact with a structure of the
semiconductor device;
5 an insulator component disposed adjacent said intermediate conductive layer; and
an electrically conductive contact layer adjacent said insulator component.

2. The contact of claim 1, wherein said insulator component is sandwiched
between said intermediate conductive layer and said contact layer.

3. The contact of claim 1, wherein said intermediate conductive layer and said
contact layer substantially envelop said insulator component.

4. The contact of claim 1, wherein said insulator component comprises an
insulator material selected from the group comprising undoped silicon dioxide, doped
silicon dioxide, silicon nitride, thermoset polymers, and thermoplastic polymers.

5. The contact of claim 1, wherein said intermediate conductive layer comprises
an electrically conductive material.

6. The contact of claim 1, wherein said intermediate conductive layer has a
thickness of about 200 angstroms or less.

7. The contact of claim 1, wherein said ^{intermediate conductive} ~~base~~ layer comprises a material having
a melting temperature that is greater than a temperature required to switch a phase
change component in electrical communication with the contact between a plurality of
states.

Sub B 8. The contact of claim 1, wherein said intermediate conductive layer comprises a material selected from the group comprising refractory metals, refractory metal nitrides, and aluminum.

5 9. The contact of claim 1, wherein said contact layer has a thickness of about 200 angstroms or less.

10 10. The contact of claim 1, wherein said contact layer comprises a material having a melting temperature that is greater than a temperature required to switch a phase change component in electrical communication with the contact between a plurality of states.

Sub P4 15 11. The contact of claim 1, wherein said contact layer comprises a material selected from the group comprising refractory metals, refractory metal nitrides, and aluminum.

20 12. A contact for a memory element of a semiconductor device that includes a phase change component, the contact comprising:
an insulator component comprising a thermally and electrically insulative material;
an intermediate conductive layer adjacent said insulator component and in electrical and thermal communication with the phase change component; and
a contact layer adjacent said insulator component and in electrical contact with said intermediate conductive layer, said contact layer and said intermediate conductive layer substantially enveloping said insulator component.

25 13. The contact of claim 12, wherein said thermally and electrically insulative material is selected from the group comprising undoped silicon dioxide, doped silicon dioxide, silicon nitride, thermoset resins, and thermoplastic polymers.

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14. The contact of claim 12, wherein said intermediate conductive layer comprises an electrically conductive material.

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15. The contact of claim 12, wherein said intermediate conductive layer has a thickness of about 200 angstroms or less.

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16. The contact of claim 12, wherein said intermediate conductive layer comprises a material having a melting temperature that is greater than a temperature that is required to switch a phase change material of the phase change component from a first state to a second state.

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17. The contact of claim 12, wherein said intermediate conductive layer comprises a material selected from the group comprising refractory metals, refractory metal nitrides, and aluminum.

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18. The contact of claim 12, wherein said contact layer has a thickness of about 200 angstroms or less.

19. The contact of claim 12, wherein said contact layer comprises a material having a melting temperature that is greater than a temperature that is required to switch a phase change material of the phase change component from a first state to a second state.

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20. The contact of claim 12, wherein said contact layer comprises a material selected from the group comprising refractory metals, refractory metal nitrides, and aluminum.

21. A process for fabricating a contact on a semiconductor device, comprising:
forming a first layer of conductive material on a surface of the semiconductor device
and in electrical and thermal communication with a structure thereof;
depositing a dielectric layer on said first layer;
5 patterning said dielectric layer to define an insulator component;
forming a second layer of conductive material substantially over an exposed area of said
insulator component; and
patterning said first layer and said second layer.

10 22. The process of claim 21, wherein said forming a first layer comprises
forming a material layer having a thickness of about 200 angstroms or less.

15 23. The process of claim 21, wherein said forming a first layer comprises
depositing a conductive material.

24. The process of claim 23, wherein said depositing comprises chemical vapor
deposition.

20 25. The process of claim 23, wherein said depositing comprises physical vapor
deposition.

26. The process of claim 21, wherein said patterning said dielectric layer
comprises etching and employs said first layer as an etch stop.

25 27. The process of claim 21, wherein said forming a second layer comprises
forming a material layer having a thickness of about 200 angstroms or less.

28. The process of claim 21, wherein said forming a second layer comprises
depositing a conductive material.

29. The process of claim 28, wherein said depositing comprises chemical vapor deposition.

30. The process of claim 28, wherein said depositing comprises physical vapor deposition.

31. The process of claim 21, wherein said forming a first layer comprises disposing a conductive material in electrical and thermal communication with a phase change component of said structure.

32. A contact for a semiconductor device including a contact layer and an intermediate conductive layer which partially contact one another and substantially envelop an insulator component, fabricated by the process comprising:
forming the intermediate conductive layer on a surface of the semiconductor device and in electrical thermal communication with an active device region of the semiconductor device;
depositing a dielectric layer on the intermediate conductive layer;
patterning said dielectric layer to define the insulator component;
forming the contact layer substantially over an exposed area of the insulator component and in electrical communication with the intermediate conductive layer;
patterning the intermediate conductive layer; and
patterning the contact layer.

33. The ^{contact}~~process~~ of claim 32, wherein said forming the intermediate conductive layer comprises disposing a conductive material in electrical and thermal communication with a phase change component of said active device region.

34. The contact of claim 32, wherein said forming the intermediate conductive layer comprises forming a thermally conductive material layer having a thickness of about 200 angstroms or less.

5 35. The contact of claim 32, wherein said forming the intermediate conductive layer comprises depositing a thermally conductive material.

36. The contact of claim 32, wherein said patterning said dielectric layer comprises etching and employs the intermediate conductive layer as an etch stop.

10 37. The contact of claim 32, wherein said forming the contact layer comprises forming an electrically conductive material layer having a thickness of about 200 angstroms or less.

15 a 38. The ^{contact}~~process~~ of claim 32, wherein said forming the contact layer comprises depositing an electrically conductive material.

20 a 39. An electrically erasable programmable memory device, comprising:
a memory element including an electrode adjacent a memory cell, at least one of said
first electrode and said memory cell comprising a phase change material; and
a contact including an intermediate conductive layer in electrical and thermal
communication with said phase change material, an insulator component
adjacent said intermediate conductive layer, and a contact layer adjacent said
insulator component and in electrical communication with said intermediate
25 conductive layer.

a 40. The ^{electrically erasable}~~programmable read-only~~ memory device of claim 39, wherein said intermediate conductive layer contacts said electrode.

electrically erasable
41. The programmable ~~read-only~~ memory device of claim 39, wherein said contact layer and said intermediate conductive layer substantially envelop said insulator component.

electrically erasable
5 a 42. The programmable ~~read-only~~ memory device of claim 39, wherein said insulator component is sandwiched between said contact layer and said intermediate conductive layer.

electrically erasable
10 a 43. The programmable ~~read-only~~ memory device of claim 39, wherein said contact layer has a thickness of about 200 angstroms or less.

electrically erasable
a 44. The programmable ~~read-only~~ memory device of claim 39, wherein said intermediate conductive layer has a thickness of about 200 angstroms or less.

15 a 45. A semiconductor device including at least one contact, *at least one* the contact comprising:
an intermediate conductive layer in electrical and thermal communication with a phase change component of a structure of the semiconductor device;
an insulator component disposed adjacent said intermediate conductive layer; and
20 a contact layer adjacent said insulator component and in electrical communication with said intermediate conductive layer.

25 46. The semiconductor device of claim 45, wherein said insulator component is sandwiched between said intermediate conductive layer and said contact layer.

47. The semiconductor device of claim 44, wherein said intermediate conductive layer and said contact layer substantially envelop said insulator component.

48. The semiconductor device of claim 45, wherein said insulator component comprises a thermally insulative material.

49. The semiconductor device of claim 45, wherein said intermediate conductive layer comprises an electrically conductive material.

50. The semiconductor device of claim 45, wherein said intermediate conductive layer has a thickness of about 200 angstroms or less.

51. The semiconductor device of claim 45, wherein said intermediate conductive layer comprises a material having a melting temperature that is greater than a temperature that is required to switch a phase change material of a contacted structure between a plurality of states.

52. The semiconductor device of claim 45, wherein said intermediate conductive layer comprises a material selected from the group comprising refractory metals, refractory metal nitrides, and aluminum.

53. The semiconductor device of claim 45, wherein said contact layer has a thickness of about 200 angstroms or less.

54. The semiconductor device of claim 45, wherein said contact layer comprises a material having a melting temperature that is greater than a temperature that is required to switch a phase change material of a contacted structure between a plurality of states.

55. The semiconductor device of claim 45, wherein said contact layer comprises a material selected from the group comprising refractory metals, refractory metal nitrides, and aluminum.

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56. An enhanced electrically erasable programmable element including a contact comprising:

an intermediate ^{Conductive} ~~conductive~~ layer in electrical contact with a structure of the semiconductor device;

5 an insulator component disposed adjacent said intermediate conductive layer; and
an electrically conductive contact layer adjacent said insulator component.

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10 57. The enhanced electrically erasable programmable element of claim 56,
wherein said insulator component is sandwiched between said intermediate conductive
layer and said contact layer.

15 58. The enhanced electrically erasable programmable element of claim 56,
wherein said intermediate conductive layer and said contact layer substantially envelop
said insulator component.

15 59. The enhanced electrically erasable programmable element of claim 56,
wherein said insulator component comprises a thermally insulative material.

20 60. The enhanced electrically erasable programmable element of claim 56,
wherein said insulator component comprises thermally insulative material selected from
the group comprising undoped silicon dioxide, doped silicon dioxide, silicon nitride,
thermoset resins, and thermoplastic polymers.

25 61. The enhanced electrically erasable programmable element of claim 56,
wherein said intermediate conductive layer comprises an electrically conductive
material.

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62. The enhanced electrically erasable programmable element of claim 56, wherein said intermediate conductive layer has a thickness of about 200 angstroms or less.

5 63. The enhanced electrically erasable programmable element of claim 56, wherein said intermediate conductive layer comprises a material having a melting temperature that is greater than a temperature that is required to switch a phase change material of a contacted structure between a plurality of electrical conductivity states.

10 Sub 311 64. The enhanced electrically erasable programmable element of claim 56, wherein said intermediate conductive layer comprises a material selected from the group comprising refractory metals, refractory metal nitrides, and aluminum.

15 Sub 12 65. The enhanced electrically erasable programmable element of claim 56, wherein said contact layer has a thickness of about 200 angstroms or less.

20 66. The enhanced electrically erasable programmable element of claim 56, wherein said contact layer comprises a material having a melting temperature that is greater than a temperature that is required to switch a phase change material of a contacted structure between a plurality of states.

Sub-B12 67. The enhanced electrically erasable programmable element of claim 56, wherein said contact layer comprises a material selected from the group comprising refractory metals, refractory metal nitrides, and aluminum.

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